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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/612,028	07/02/2003	Kang-Soo Chu	SAM-0421	5861

7590

04/06/2004

Steven M. Mills
MILLS & ONELLO LLP
Suite 605
Eleven Beacon Street
Boston, MA 02108

EXAMINER

PHAM, LONG

ART UNIT PAPER NUMBER

2814

DATE MAILED: 04/06/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/612,028

Applicant(s)

CHU ET AL.

Examiner

Long Pham

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) 1-6 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 7-16 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of claims 7-16 in Paper No. 01/30/04 is acknowledged.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 7, 8, 9, 10, 11, 12, 13, 14, 15, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over the applicant's admitted prior art (AAPA) of this application in combination with Mercaldi (US '308).

With respect to claim 7, AAPA teaches a method for fabricating a semiconductor device having an etch stopper formed of a nitride film, the method comprising (see figs. 1-2 and the Field of the Invention of this application):

forming a gate pattern 20 on a semiconductor substrate 10 in which the gate pattern includes a first nitride film 26,28 formed using low pressure chemical vapor deposition for a top layer 26 and sidewalls 28;

forming an etch stopper 30 which covers the gate pattern and the substrate to a thickness and comprises a second nitride film 30 formed in low pressure chemical vapor deposition;

depositing an interlayer insulating film 40 on the substrate where the etch stopper is formed;

forming a self-aligned contact hole 60 by dry etching the interlayer insulating film using the gate pattern as a mask; and

removing the etch stopper which is exposed to the self-aligned contact hole by dry etching.

AAPA teaches that the etch stopper of nitride is formed by low pressure chemical vapor deposition but fails to teach the etch stopper is formed low temperature atomic layer deposition.

Mercaldi teaches that nitride formed by low temperature atomic layer deposition has low electrical tunneling probability and low defect densities. See page 6, [0050].

It would have been obvious to one of ordinary skill in the art of making semiconductor devices to form the etch stopper of nitride by low temperature atomic layer deposition to obtain the above advantages.

With respect to claim 14, AAPA further teaches the dry etching for forming the self-aligned contact hole continues until the etch stopper is exposed.

With respect to claims 7, 15, and 16, AAPA teaches removing the etch stopper of nitride by dry etching but fails to teach removing the etch stopper of nitride by wet etching and SC1 cleaning method.

However, the removal of nitride by wet etching and SC1 cleaning is well-known to one of ordinary skill in the art of making semiconductor devices.

With respect to claims 12 and 13, the formation of interlayer insulator of single layer or multi-layer of SiO₂, BPSG, HDP oxide, or FOX is well-known to one of ordinary skill in the art of making semiconductor devices.

With respect to claims 9 and 11, AAPA and Mercaldi fail to teach the deposition temperature of the second nitride and the thickness of the second nitride.

However, it would have been obvious to one of ordinary skill in the art of making semiconductor devices to determine the workable or optimal value or range for the deposition temperature of the second nitride and the thickness of the second nitride through routine experimentation and optimization to obtain optimal or desired device performance because the deposition temperature and the thickness of the second nitride are result-effective variables and there is no evidence indicating that the deposition temperature and the thickness of the second nitride are critical or produce any unexpected results and it has been held that it is not inventive to discover the optimum or workable ranges of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05.

With respect to claim 10, the use of SiH_4 , SiCl_2H_2 , or SiCl_4 as silicon source and N_2 , NH_3 , or N_2O as nitrogen source in etching are well-known to one of ordinary skill in the art of making semiconductor devices.

With respect to claim 8, AAPA further teaches depositing a gate electrode 22, a silicide layer 24, a top layer 26, which comprises the first nitride layer formed using low pressure chemical vapor deposition, on the substrate and forming the gate spacer, which comprises the first nitride film formed using low pressure chemical vapor deposition, on the sidewalls of the gate electrode, the silicide layer, and the top layer.

AAPA appears to fail to teach etching the gate electrode, the silicide layer, and the top layer to form the gate pattern.

However, such etching is well-known technique for forming a gate pattern.

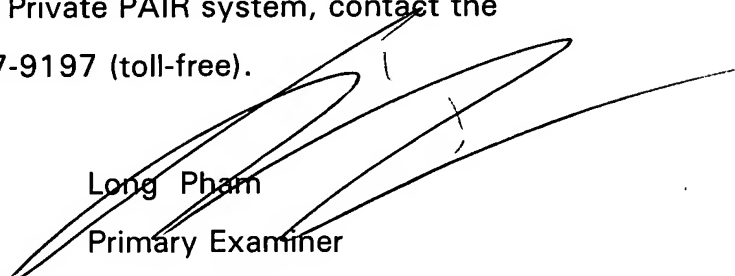
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Long Pham whose telephone number is 571-272-1714. The examiner can normally be reached on M-F, 7:30AM-3:00PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Long Pham
Primary Examiner
Art Unit 2814

LP